

Space News Roundup

Storm damage is widespread; 4 injuries minor

Hurricane-force winds and heavy rain caused widespread damage to buildings, automobiles and trees at JSC and Ellington Field this past week and resulted in four minor injuries.

JSC's storm-related problems were a continuation of the severe weather system that caused dozens of serious injuries and damage elsewhere along the Texas coast.

"I suspect we even had some tornado-type winds go through the site in order to cause the damage that was done," said Bill Roeh, deputy chief of the Plant Engineering Division.

Two NASA employees and two contract employees received minor injuries when the severe thunderstorm struck the morning of Nov. 16. All were treated at the the JSC Clinic and released. None required further hospital treatment, said Chief Nurse Beverly Wilson.

One woman's ankle was injured when a large window in the Bldg. 3 cafeteria blew in and she and the other occupants dove to the floor to protect themselves, Wilson said. A shuttle bus passenger suffered leg cuts when the windows of the bus were hit by debris while on Upper Bay Road, and a young man suffered cuts to his arms when a Bldg. 16 exterior glass door was broken. A fourth person received a minor cut when he was "blown off his feet" as he ran to Bldg. 49 from the government van he had been in. Names of the employees were not released.

No cost estimates were immediately available, but roof repairs for Bldg. 9A will be the most substantial repair effort, Roeh said.

"Except for 9A, the roof damage was minor—nothing else major on site. We did have a few windows blown in, a few glass doors in different buildings that were damaged," he said. "For the most part, flying debris was the primary cause of damage."

Damage occurred at Ellington Field on the west side of Bldg. 135, where a contractor was replacing siding. Plastic covering that would have protected the building from a normal rain was ripped away, allowing water to damage second floor interior offices and furnishings, Roeh said.

Nearly three dozen cars belonging to JSC employees were damaged by flying debris near Bldgs. 9A, 44 and 49, he said. A number of trees were uprooted or broken off at the trunk near the Gilruth Recreation Center, and a Space Station module mock-up stored near Bldg. 49 crashed into a truck, damaging the mock-up.

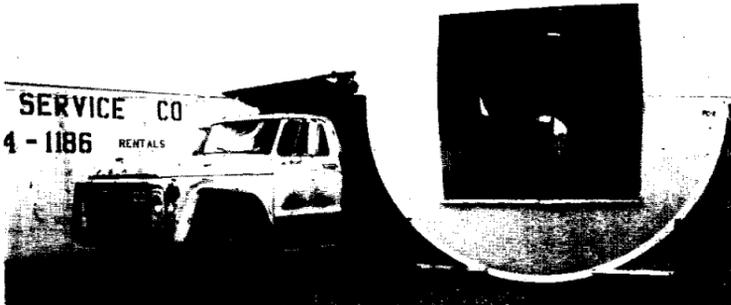
Damage and extended power outages were reported at NASA contractor facilities in the Clear Lake area, including Rockwell, Computer Sciences Corp. and Omniplan.

Aside from delays caused by an hour and a half power outage to buildings in the 200 and 300 area, operations on the JSC site were not seriously interrupted, Roeh said.



JSC Photo by Mark Sowa

Above: One of about three dozen cars that were damaged at JSC sits beneath a pile of debris blown from the Bldg. 9A roof. Below: The rear of a dump truck protrudes through the wall of a Space Station module mock-up that was caught by the wind outside Bldg. 49.



JSC Photo by Sheri Donnette

Landing load rise helps ease backlog

End-of-mission allowable landing weight for Space Shuttle orbiters has been increased as a result of on-going structural analysis and additional review of forces encountered before landing, according to Rear Adm. Richard Truly, associate administrator for space flight.

The allowable landing weight has been increased to 230,000 pounds from the previous limit of 211,000 pounds.

Initial analysis indicates the change will allow the Shuttle to carry a cumulative weight in excess of 100,000 pounds of additional payloads into orbit through 1993, Truly said. The additional down-weight capability also will provide an important balance between delivery and return cargoes at the Space Station orbit of 220 nautical miles, he added.

"The total Space Shuttle performance capability requires a balance between lift capacity to orbit and the allowable return weight during reentry and landing."

(Continued on page 2)

Stacking drill tests process

Kennedy Space Center workers, assisted by JSC, Marshall and Morton Thiokol personnel, began reviewing procedures for stacking the STS-26 solid rocket motors this month as firing tests of the redesigned SRM continued elsewhere.

The group at KSC is stacking and destacking the SRM assembly test article (ATA), using for the first time new tools, equipment and revised procedures. The test will certify the new equipment and procedures, provide training for ground crews, demonstrate field joint leak check procedures and gather data to improve the process.

(Continued on page 2)



Central Computing Facility construction begins

By Billie Deason

Construction of a Central Computing Facility designed to keep JSC at the forefront of computer technology in the Space Station era began recently under a \$5.672 million construction contract.

Cahaba Construction Co. of Houston is building the first major facility constructed at JSC since 1971. The structure will house computer systems with a projected

value of \$88 million dedicated to both Space Shuttle and Space Station programs. The new building will provide a higher level of computer security to protect critical Space Shuttle software processing systems and will provide for growth of JSC computer systems that cannot be accommodated in existing facilities.

The building is designed to allow for expansion of the facility to

126,000 square feet to accommodate future data processing requirements. The building also will support hardware in the super computer class.

The three-story steel-framed building will have 66,800 square feet of floor space on Second Street between Bldgs. 45 and 47, and will be numbered Bldg. 46. There will be office space for 30 employees as well as tape libraries and opera-

tions support areas.

Construction is expected to be complete in October 1988.

Also bidding on the construction contract were: Tellepsen Corp.; Lebco Construction, Inc.; Baxter Construction Co., Inc.; Valcon III, Inc.; Lawson-Avila Construction Inc.; W.S. Bellows Construction Corp.; and Robert E. McKee, Inc., all of Houston.

Tests evaluate escape systems

Tractor rockets, telescoping pole eyed

Two concepts to provide crew egress capability during Space Shuttle controlled gliding flight are being tested this month at the Naval Weapons Center at China Lake, Calif.

The two escape methods are tractor rockets that would extract the astronauts through the open hatch and a telescoping pole that would extend through the hatch for the crew members to slide down using a lanyard attached to the rod.

Tractor rocket tests were scheduled to begin Nov. 20. A series of 12 tractor rocket tests will be conducted using life-like dummies that will be pulled from a Convair-240 aircraft modified to simulate the hatch opening of an orbiter.

The first six tests will be developmental tests conducted approximately two weeks apart, and results of each test will be thoroughly analyzed so modifications can be made prior to the next test if necessary. After the six developmental tests, there will be two design verification tests. The last four certification tests will use dummies that are fully outfitted with Shuttle flight gear and equipment.

"Objectives of the tests are to establish performance margins and to certify the tractor rocket system for flight," said Robert R. Rice, manager of the Tractor Rocket Test Program.

Telescoping pole tests are scheduled to begin Nov. 30. There will be a total of 14 tests. The pole concept will be tested using volunteer Navy parachutists to slide along the rod extending from a Buffalo aircraft and then later from a C-141 aircraft.

The jumpers will attach a lanyard to the pole, exit the aircraft in a tucked position, release at the end of the pole and parachute to the ground. Objectives of the test are to establish the feasibility of this concept and to determine the margins on orbiter wing clearance.

After completion of the two test programs, data will be evaluated and presentations will be made to NSTS managers who will make a decision early next year on which of the two egress methods may be incorporated into *Discovery*. The test and evaluation period will allow the addition of either system prior to STS-26.



Photo by Jerry Skains

Test operators fire one of three successful tractor rocket tests from a 500-foot cliff at Hurricane Mesa, Utah, in October. In the tests, anthropomorphic dummies safely cleared the vehicle.

People



Greene

Managers get new posts

Astronaut **Charles F. Bolden, Jr.** has been appointed lead astronaut for vehicle test and checkout at Kennedy Space Center. While chief of the Safety Division, Bolden supervised a major reorganization and helped reshape the focus of the division. Bolden will remain at JSC while working closely with Orbiter processing personnel at KSC as lead for the Astronaut



Bolden

Office's Vehicle Integration Test Team.

Jay H. Greene, a Space Shuttle flight director from 1982 to 1987, will succeed Bolden as chief of the Safety Division. His most recent assignment was coordinator for the mission analysis aspects of JSC's contribution to Dr. Sally K. Ride's recent report, "Leadership and America's Future in Space."



Butterworth

Secretaries recognized

Rita Butterworth, lead secretary for the Test and Ground Systems Engineering Office, has received the Marilyn J. Bocking Secretarial Excellence Award. Reviewing large volumes of signature mail, follow-up action and day-to-day office administration is the workload that she handles in an efficient manner. During a recent office reorganiza-



Howski

tion, Butterworth ensured continuing operation was smooth and efficient and is cited for outstanding support.

Nancy Howski, a secretary in the Office for Procurement Matters, also received the Bocking Award recently. As secretarial, clerical and administrative support to Assistant Chief Counsel John K. Lottinville and assigned staff, Howski produces quality legal documents. Howski may be noted as a "secretary's secretary", because of her pattern of dependability during prescribed deadlines and peak workloads.

Bulletin Board

JSC Blood Drive scheduled for Nov. 23

The third JSC Blood Drive for 1987 is scheduled for Nov. 23 at the Gilruth Recreation Center. Appointments can be made between the hours of 8 a.m.-noon and 1-4 p.m. For more information call Helon Crawford, JSC Blood Bank chairperson, at x34714. For appointments call Crawford, Mary O'Rear, x36531, or Bob Jones, x33004.

Lunch and learn Thermal Management Systems

Richard Parish of the Crew and Thermal Systems Division will discuss Space Station Thermal Management System Concepts during a lunch and learn presentation Dec. 10. The session, sponsored by the AIAA Thermophysics Technical Committee, will begin at 11:30 a.m. in the Bldg. 3 cafeteria. For more information, call Dr. Abdul Hye, 333-6515.

Computer language group to meet Nov. 30

The JSC Computer Language Users Group will hold its next meeting from 11:30 a.m. to 12:30 p.m. Nov. 30 in Bldg. 30, Rm. 3014. Officers will be elected at the meeting, but attendance is not required for a member to be elected. Interested NASA and contractor personnel are invited. For more information call Keith Brown, x38952, Bernie Rush, x39092, or John Box, x33349.

NASACOMM alters meeting place

NASACOMM, a Commodore User's Group, will begin holding meetings on the 2nd Wednesday of each month at 7:30 p.m. The group will have its first meeting at a new location, the Harris County Park Bldg., 5001 Nasa Road 1, on Dec. 9. Anyone interested in Commodore computers is invited to attend. For more information, call Bill Moore, 335-6251 or x53462.

Electrical engineers to host fiber optics seminar

The Institute of Electrical and Electronics Engineers' (IEEE) Education Committee is sponsoring an educational seminar on Dec. 9 by AT&T. Fiber optics technology will be the topic of discussions, a tutorial and a presentation on future trends. Another feature will include large and local networks. The seminar at Lockheed Plaza 1, Rm. 201, 2450 Nasa Road 1, is free. Preregistration is recommended. Call Eddie Robinson, 333-7029, to register.

Astronomy seminar session listed

The Dec. 2 JSC astronomy session will present a video tape on "Further Exploration of Mars." The video will be shown between noon and 1:00 p.m. in Bldg. 31, Conference Rm. 193. For more information call Al Jackson, 280-2296.

Gilruth Center News

Call x30304 for more information

Badges needed for all EAA activities—All employees are reminded that a new identification system will be in effect beginning Dec. 1. The Employee Activities Association (EAA) in conjunction with the JSC Exchange Council has developed a system that requires all employees using the Gilruth Recreation Center to show their NASA badges. Photo identification cards will replace the EAA activity cards, and family members who use Gilruth facilities will need to have a photo ID made. To schedule a badging appointment, call the Recreation Office at x30303.

Basketball and volleyball—Registration for the next season will be Dec. 7 through 11. For more information, call the recreation office.

Three-on-three basketball—A three-on-three basketball tournament for Men's B, C and Over 40 and Mixed teams will be played Dec. 1, 2 and 3. Entry fee is \$21. Entry deadline is Nov. 25.

Orienteering—Test your navigational skills and endurance at 10 a.m. Saturday, Dec. 5. Three separate courses will be offered, based on distance and level of difficulty. Entry fee is \$4.

Defensive driving—Course is offered Dec. 19 from 8 a.m. to 5 p.m. and costs \$20.

Initiatives encourage commercial space activity

A series of new program initiatives have been created to expand the opportunities for pioneering commercial ventures in space, according to NASA Assistant Administrator for Commercial Programs James T. Rose.

The steps will build on earlier commercial development policies and provide for the continued encouragement of private space activities as the Space Shuttle returns to flight.

Rose, recently named to head NASA's Office of Commercial Programs, outlined the new initiatives to a gathering of more than 200 senior corporate executives meeting with NASA officials to explore the commercial uses of the Space

Station.

He said NASA's Commercial Programs Office will:

- Form an industry advisory committee to provide regular input to the Office of Commercial Programs on a broad range of commercial space issues, including recommendations on space research priorities.

- Develop and recommend a new pricing policy for the use of government transportation and on-orbit services by emerging commercial ventures.

- Develop a plan to manage and optimize the 28 percent space allocation for commercial secondary payloads aboard the Space Shuttle and guidelines for users

that could enhance their chances for flight opportunities.

- Streamline the process by which companies negotiate formal agreements with NASA for cooperative space activities.

- Provide new opportunities for the small business entrepreneur to lend their creativity and innovation to space commercialization activities through NASA's Small Business Innovation Research Program.

"These initiatives are needed to ensure that the agency is capable of dealing effectively with the post *Challenger* accident era of commercial space endeavors," said Rose. "We will develop systems to give commercial payloads the best possible chance of a timely flight."

Musgrave flies record 6,000 hours in T-38

Reprinted from Northrop News

NASA astronaut Dr. F. Story Musgrave was honored recently by Northrop Aircraft Division's Management Club after becoming the first person to fly 6,000 hours in the Northrop-built T-38.

The milestone flight occurred Aug. 4 on a flight for NASA. He is the only person to have achieved, or expected to achieve, that many hours in the T-38.

Six thousand hours is the equivalent of 250 days. Flying non-stop, a person would have to take off at the stroke of midnight on New Year's Eve and fly continuously to the stroke of midnight on September 7 to achieve 6,000 hours.

All of his hours in the T-38 were achieved as a NASA pilot. There was no active duty military flight time involved. His T-38 flights averaged one hour.

In all, Musgrave has accumulated more than 15,700 total flight hours, including more than 6,400 in jet aircraft and 312 hours in space.

Musgrave, who received a commemorative plaque at the August dinner meeting of the division's Management Club, was selected by NASA as a scientist-astronaut in August of 1967. He flew as a mission specialist on STS-6 and 51-F.



Photo by Hubert Cook

The Max-Q Band entertains fajita connoisseurs at the Flight Crew Operations Division's fifth annual Fajita Fiesta. Band members are, left to right, Brewster Shaw, Pinky Nelson, Jim Wetherbee and Hoot Gibson. Those who attended the Nov. 13 fiesta in Hangar 990 at Ellington Field feasted on food, music and dancing.

Landing load gain to add flexibility

(Continued from page 1)

Truly said. "This new capability will improve this balance and add considerable flexibility and efficiency to our Space Transportation System."

The possibility of flying all Spacelab missions on the *Columbia* spacecraft is being assessed as a result of the change. Such an

approach would allow *Columbia* to be configured for increased on-orbit duration and allow optimum use of *Discovery* and *Atlantis*, both of which have greater ascent lift capability.

Although the capability is effective immediately, only certain flights on the Shuttle manifest have been limited by the landing weight con-

straint. The first flight planned to take advantage of this increased Shuttle capability is STS-32, presently scheduled to fly the ASTRO-1 mission in the summer of 1989. Additional payloads to be added to this and other missions are being assessed and will be assigned when the next edition of the Shuttle manifest is issued.

Joint simulator test finds no leakage

(Continued from page 1)

"We want to demonstrate how to best put this new joint together," said Charlie Stevenson, chief, External Tank/Solid Rocket Booster Mechanical Systems Section. "The new joint has, what is called in the industry, a 'mechanical interference fit' where metal touches metal. Therefore, the tolerances are tighter."

The 30-day test also will allow managers to evaluate new policies related to around-the-clock operations.

"We're not going to put ourselves in a posture to have fatigue be a factor to our process," said KSC Launch Director Robert Sieck. "We've got new overtime policies that apply to all the work force. The performance of the work force is going to be the driving factor."

Meanwhile, disassembly and analysis of the the Nov. 9 firing of an intentionally flawed joint Environment Simulator 3-B (JES 3-B) continued, and engineers at Marshall prepared to fire a Transient Pressure Test Article (TPTA).

Initial results of the JES 3-B firing at Morton Thiokol's Wasatch Operations site in Utah showed no evidence of hot gas leakage past either the capture feature O-ring of the forward-to-aft joint or the primary O-ring of the aft-to-external tank (ET) attach joint, said JSC's Rod Lofton, SRM project integration manager.

"I think it was a good firing," Lofton said. "No real surprises."

Test objectives were to evaluate the sealing capability of the redesigned field joint's primary O-ring when pressurized by combustion gasses, evaluate the capture feature O-ring's sealing capability, and to obtain data on gas temperatures beyond the interference fit to verify models, Lofton said.

The forward cylinder to aft joint insulation J-seal contained an internal flaw designed to ensure hot gas leakage to the capture feature (innermost) O-ring. The aft cylinder to ET attach joint J-seal insulation had a still larger intentional defect designed to test its capture feature O-ring. The aft cylinder to ET attach

joint capture feature O-ring had an intentional diameter reduction that, when aligned with the insulation flaw, ensured hot gas flow to the capture feature interference fit.

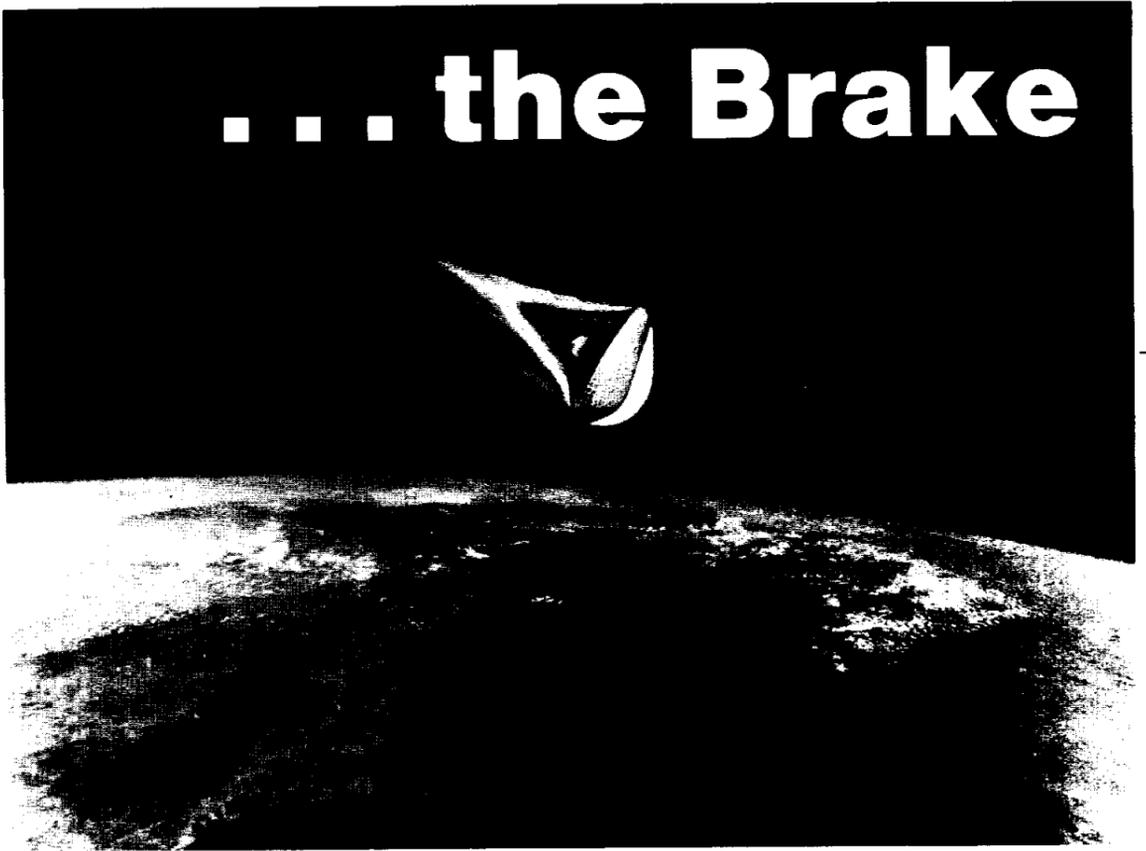
At KSC, two SRM segments with live propellant make up the assembly test article: the aft segment and the aft center segment.

Because the tolerances of the new field joints are tighter, a new circular tool was developed to help guide the segments and ensure a perfect fit. This tool, called the field joint assembly fixture (FJAF), features 88 guide blocks along the circumference of the tool to ensure its performance.

A new leak check apparatus tool is more sophisticated in detecting leak rates in the field joints than the tool used before. The new design requires an additional series of leak tests.

In addition to the new tooling and procedures, the ATA and associated tools are being outfitted with more than 100 different instruments so engineers can assess the performance of the month-long test.

Putting on . . . the Brake



Technical design team gives aerobrake concept shape and substance from start to finish

By Beverly Green

After hurtling through the outer worlds of our solar system, the spacecraft skipped into the Earth's shadow. The Martian orbit had been successful and the voyage to a low Earth orbit depot was completed at super-orbital speed. In a port of space, the spacecraft calmly docked.

Fascinating scenario, but it may well be the turn of the century before it becomes true. Today, JSC is in the forefront of developing a Shuttle-launched and recovered experimental spacecraft that will establish the probability of using aerobraking for both Earth orbital and planetary entry vehicles.

The JSC technical community is designing the aerobrake, a structure that will allow spacecraft to slow down by using atmospheric drag rather than costly fuel. In fact, the Mars Sample Return project that JSC is working on with NASA's Jet Propulsion Laboratory will use aerobraking concepts above both Mars and Earth.

The complete aerobrake design and analysis is being performed in-house and will be tested to prove the concept sound. A full-scale mock-up is being constructed in Bldg. 9 to support experiments in advanced space transportation.

A full-sized model of the basic shape of the aerobrake is near completion. Experiments will be integrated using the model.

"Fifty-four long wooden ribs have been sprayed with foam and roughed by hand forming the computer design. Fiberglass has been laid on the foam model and will peel off to form a shell," said Jack Bird, a production controller in the Technical Services Division. "We'll also have a tremendous responsibility of fitting unusual shapes into the basic shape," he added.

About 40 JSC technical personnel are involved in this project that could provide an important tool needed to move into the future.

"Several years ago a team was formed to create a preliminary design to develop a cost estimate and we are now responsible for the design of the scaled-down version to go in the Shuttle payload bay to demonstrate the feasibility of this idea," said Dr. William Schneider, Branch Chief of Mechanical Design and Analysis.

The aerobrake structure is one of three basic components of the Aeroassist Flight Experiment (AFE). The AFE project is managed by Marshall Space Flight Center. Aeroassist is a generic term encompassing various maneuvers in which a vehicle is slowed by a planet's atmosphere without making a complete entry.

Major components of the 800-pound aerobrake payload are the structure, the Thermal Protection System (TPS) and instrumentation. The 14-foot-diameter

structural disc may be made of 7075 T6 aluminum and will fit inside the orbiter payload bay. The TPS will be attached and made up of standard Shuttle tiles. The aerobrake structural design is directed and managed by Robert McElya of the Design and Analysis Branch.

"In-house fabrication of both test and flight articles provides the unique opportunity of hands-on training for new JSC employees in related areas. Ideas that could have remained on paper have been given an opportunity to give shape to imagination."

—Don Curry

"We're using the Shuttle TPS tile system because it's a certified system, therefore we can save time and money," said McElya.

As a result of various instrumentation, JSC has four principal investigators in the Aeroscience Branch of the Advanced Programs Office who are directly responsible for two of the 13 potential experiments. Dr. Carl Scott, an aerothermodynamics

group leader and Michael Jansen, an aerospace engineer, are responsible for the Base Flow and Heating experiment.

"This experiment will determine flow environment in the base region of the vehicle by flow visualization and by measuring pressures and heating rates. These measurements will be used to validate flow prediction techniques needed for determining how the base area has to be protected for advanced space vehicles such as the Aeroassist Transfer Vehicle," said Scott, co-principal investigator.

Co-principal investigators Chris Cerimele, an aerospace engineer, and Joe Gamble, a flight mechanics group leader are responsible for the Aerodynamics Performance Experiment (APEX). "APEX will measure the vehicle motion to extract the actual flight aerodynamics. Preflight data will be compared against actual aerodynamics and could validate a relatively new science called Computational Fluid Dynamics," said Cerimele. That science uses physical laws that govern the flow field around a body for the pressure distribution predictions, he explained.

Ames Research Center is responsible for four of the experiments and Langley Research Center is responsible for the other seven. "Final selection of experiments will be in mid '88 and depend upon the maturity of the experiment at that time. If they are ready to go, they

will be selected," said Dr. Don Curry, Project Area Manager.

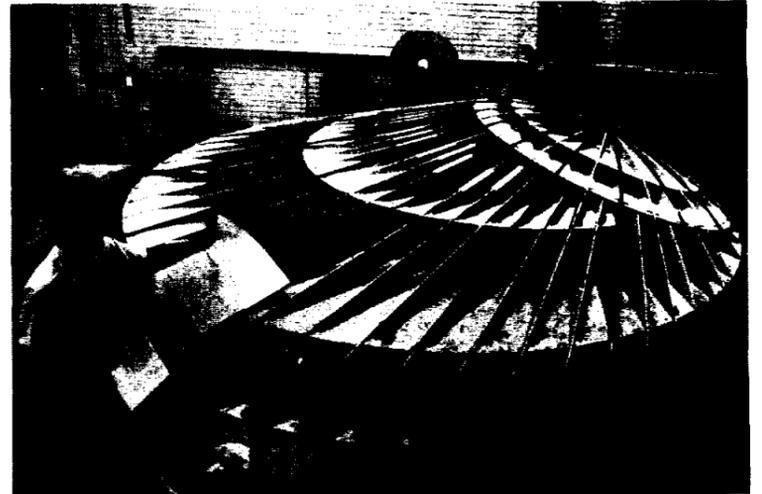
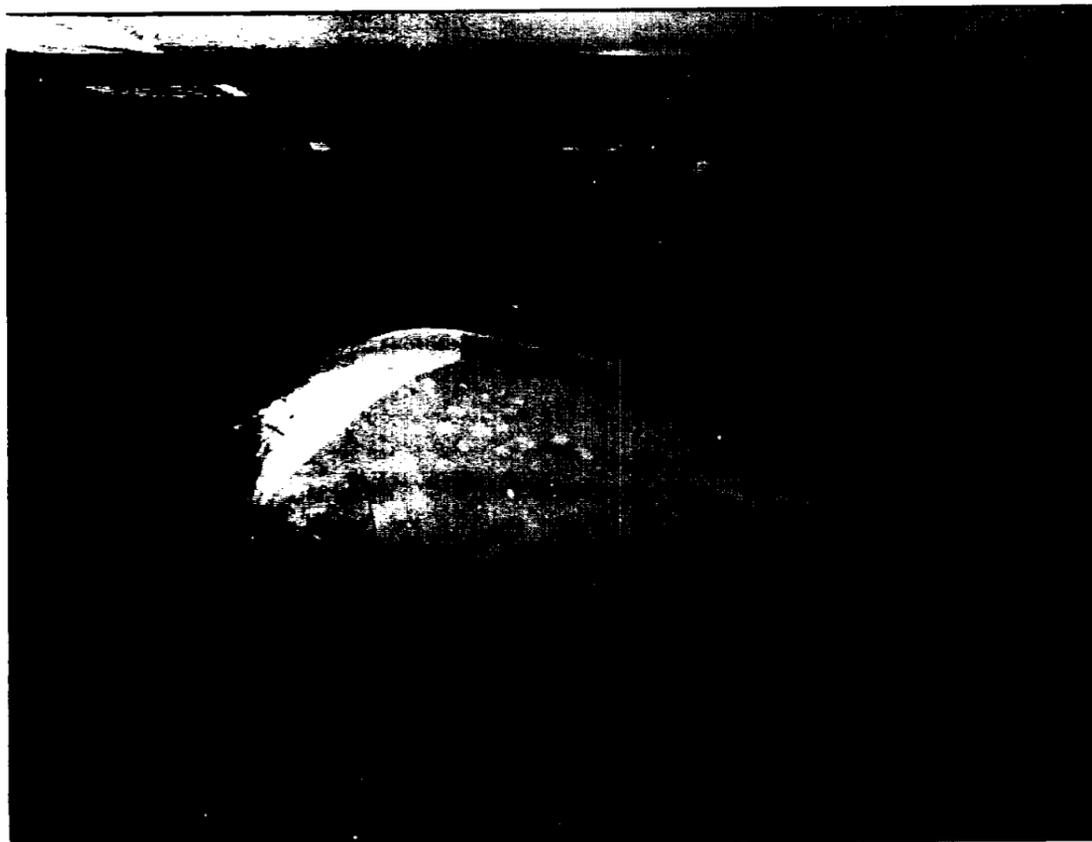
Under the guidance of John Kennedy of the Mechanical and Design Analysis Branch, JSC also has responsibility for ensuring that all aerobrake instruments are installed and function.

"Once these experiments have been verified, they will provide data for advanced design of re-entry vehicles for other planetary return velocity such as the Mars mission or lunar return," Curry explained.

The JSC technical division, using design drawings and analysis supplied by the JSC design team, will fabricate both the test and flight articles. "We plan to run the qualification tests in both our acoustic vibration and thermal facilities. Once that has been done we will deliver the aerobrake to the Kennedy Space Center where we currently plan to install the Thermal Protection System," he added.

"In-house fabrication of both test and flight articles provides the unique opportunity of hands-on training for new JSC employees in related areas. Ideas that could have remained on paper have been given an opportunity to give shape to imagination," Curry said.

The entire aerobrake will be delivered to Marshall for final integration with the carrier vehicle. The flight currently is scheduled for 1993.



Top: An artist's concept illustrates how an aerobrake might look while skipping through the Earth's atmosphere. Above: Designer Jon Kahn compares the framework for the aerobrake mock-up with his construction plans. Left: Tom Loosmore, an engineer technician model maker, prepares to make a fiberglass cast of the mock-up. The cast will be used to fit instruments and equipment inside the aerobrake.

Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

Property & Rentals

Lease: Baywind II townhouse, 2 story, FPL, W/D, fans, pool, tennis, \$480/mo. Jeff, x30715 or 280-8608.

Lease: Pasadena/South Houston, 3-1.5-2 brick, central A/H, carpet, drapes, appliances, no pets, \$445/mo. 941-5908.

Lease: Galveston beach house, 2-2, beach 100 yds., boat landing 4 blocks, marina w/pool, \$500/week, weekend rates available. Fendell, 481-0679.

Lease: 2-1-2 condo, storage room, W/D conn., fans, miniblinds, cable, ice maker. 488-0719.

Sale/Lease: El Dorado Trace, 2-2, FPL, patio, wet bar, appliances, cost or down payment, we pay \$500 cash at closing. 488-0667.

Sale: Memorial Oaks cemetery, 2 choice lots, section 8-A, both \$1,200 OBO. 482-0497.

Lease: Baywind II condo, 1 BR, up-stairs, drapes, new carpet, FPL, appliances, W/D, tennis, pool, \$295/mo. Chuck, x35402 or 488-5019 eve.

Sale: 13.5 acres, gently rolling wooded East TX land, front county blacktop, near Tyler and Henderson, assumable low cost TX. Vet. loan. McLeaish, 480-7445.

Sale/Lease: San Leon, 2-1, 1,100 sq. ft., near water, AC, FPL, vault ceiling, storage, utility, large deck, W/D, refrig., large lot 75' x 150'. Doug, x32860.

Lease: El Dorado Way 2-2 condo, W/D, \$410/mo., \$200 deposit. Rick, x36156 or 480-1218.

Lease: Tranquility Lake, 1-1 condo, FPL, fan, W/D, appliances, security gates, pools, jogging trail, fishing, \$350/mo. 486-4466.

Lease: 3-1.5 townhouse, 2 story, corner unit, fenced yard, covered parking, \$475/mo., available mid-Dec. 486-4466.

Sale: League City/Kemah area, 3-2 country home, 1.33 acres, high carport, garage combination, hi. effi. AC. 334-1883.

Sale/Lease: Friendswood/Wilderness Trails, 3-2-2, custom drapes, deck, 5 min. from high school, \$700/mo. or \$69,500 assumable. Les, x36914.

Sale/Lease: '80 mobile home, 2-1, 14' x 56', AC, ex. cond., 7 min. to TX A&M, equity plus assume \$122/mo. or rent for \$235/mo. Scott, x37115 or 485-4364.

Lease: Piper's Meadow, 3-2-2, drapes, FPL, patio, new paint, fence, gas utility, \$550/mo. 482-6609.

Lease: West Galveston beach house, 3-2, central A/H, daily/weekly rates. Shumilak, x37686 or 482-7723.

Sale/Lease Purchase: Seabrook, 3-2-2, new paint. Chuck, x32163 or 470-8377.

Sale: Inverness by the Sea, 2-2, 1 week timeshare, early May, seawall in Galveston, exchangeable with resorts across country. Regenburgh, 482-1156.

Sale: Clear Lake City, 3-2-2A, new vinyl flooring, stain-master carpet, FPL, fans, remodeled kitchen, microwave, customized cabinets, screened patio, built-in gas grill, near park, elementary school, \$68,000. Bonnie, x30020 or 488-5390.

Sale/Lease: Lake Livingston waterfront lake house, on Indian Hills peninsula, 85' fishing pier. Jerry, x39287 or 554-6093.

Residential lot, 75' x 150', heavily wooded, lake view, all utilities available, \$19,500. 474-3181.

'80 Mobil home 14' x 60', 2-1, central A/H, ex. cond., \$6,000. Ken, x34675 or (409) 925-8759.

Lease: Lake Livingston waterfront house, 3-2, sleeps 8, furnished, pier, ex. fishing, skiing, swimming, weekend, weekly rates. 482-1582.

Cars & Trucks

'84 Ford Ranger P/U V6 Texas Lariat, loaded, DLX camper shell, 32K mi., 2 tone, ex. cond. John, x30018 or 488-4487.

'85 Mallard motor home, low miles, loaded, \$7,000 and assume note or \$42,000. 337-4056.

'86 Hyundai Excel GL, 4-dr. hatchback, 5 spd., AM/FM/tape, A/C, tinted window, ex. cond., 28K mi., \$5,200. Roseann, 332-9231.

Sale: '85 El Dorado fully loaded, white, leather interior, ex. cond., \$14,975. 488-2716.

'67 Diesel Mercedes 220, 4 dr., sun roof, \$2,795 or trade pickup truck of equal value. Raul, 947-9444.

'78 Mercury Monarch, 4 dr., new paint, undercoating, rebuilt trans., tinted glass, vinyl top, AM/FM/tape, ex. interior, 66K mi., \$2,000. Brenda, x37747 or 948-1672.

low miles, ex. cond., \$7,000. Williams, x32770 or 488-8048.

'83 Peugeot 505 Turbo Diesel, 55K mi., ex. cond., \$3,900. 474-2610.

Travel Trailer camper, sleeps 4, ex. cond., \$1,500. Higginbotham, x30935 or 388-2325.

'76 Toyota Corolla, 4 spd., PB, good cond., \$600. 488-2000.

'73 Thunderbird, V8, loaded, leather, 81K mi., white, black vinyl top, \$2,000. Kevin, x33838 or 471-7889.

'84 Honda LX, 5 spd., 4 dr., dr. locks, PW, cruise, stereo, \$6,950. Chuck, x30092 or 481-3637.

'76 Corvette, 4-spd., PS, PB, PW, AM/FM, A/C, tilt, new tires, ex. cond., \$6,300. Tom, x35488 or 482-9172.

'83 Olds Omega, PS, PB, A/C, 4 cyl. auto., white/blue interior, ex. cond., \$3,200 OBO. Jim, x33428 or 488-0140.

'81 Corvette, all power, 4,800 mi., ex. cond. Jim, x33428 or 488-0140.

'70 Chevy Nova, dark green, 4 dr., 57K miles, good cond., \$800. 333-2359.

'82 Corvette, loaded, silver/burgundy, 50K mi. 487-2383.

'83 Oldsmobile Firenza, 3-dr. hatchback, 2.0L fuel injected engine, AM/FM/tape, cruise control, good cond., \$1,750. Watts, 480-0303.

'86 Pontiac Fiero, gold, AC, AM/FM, tilt S/W. Don, 282-3521.

'84 Ford XLT 150 pickup, red, auto, sh. box, BKT STS, 8 cyl., electric pkg., sldg. rear window, AM/FM/tape, chrome wheels, \$6,260. Brent, 333-9686.

'80 Olds Toronado, V-8, PL, PS, PW, power moonroof, 67K mi., \$3,695. Jerry, x38922 or 333-9003.

'84 Fiero, red, loaded, 23,500 mi., \$6,000. Gary, x34090 or 480-5842.

'82 Jaguar XJS-HE, blue w/biscuit interior, 56K mi., ex. cond., \$17,600. LeAnn, 282-2522 or 947-0907.

'79 BMW 320i, 4 spd., loaded, AC, sunroof, \$3,800. 486-0462.

'78 Ford Fairmont, \$600, driveable, needs work. 488-2205.

'55 Olds Holiday 98 Rocket, antique auto collectors' dream, original parts, runs great, \$3,000. MJ, 480-7226.

Boats & Planes

'80 21' Chaparral, 470 Mercruiser I/O cutty cabin, diving platform, top w/curtain enclosure marine radio, CB radio, porta pottie, good cond., \$7,250. Max, x37249 or 337-5760.

'78 MacGregor 25, sleeps 4, jib/genoa/main, 7.5 hp Honda OB, trailer, extras, BO over \$4,500. Sally, 480-8190 or 326-1608.

R/C airplane, high wing trainer w/ailerons, K&B 40 engine installed, ready to fly, \$100. 483-0701.

Hummer Ultralight Aircraft, parachute, 30 hrs. on airframe, always hangered, \$1,500. 333-2431.

'82 Prindle 18' Catamaran, stored in shed, galv. trailer, sail and box storage, \$2,950. CW, x35188 or 280-8796.

Cycles

'83 Peugeot 12 spd., ex. cond., \$175. 488-2000.

Boys 24" 10 spd. bike, \$50. Levy, x30701 or 367-8107.

'79 Honda CX 500 custom, 13K mi., one owner, good cond., \$750. Julie, x31540 or 482-0833.

'80 Honda 750 motorcycle, low miles, mags, garaged, \$1,350. Chuck, x30092 or 481-3637.

'85 Suzuki GS 700E, 2450 mi., ex. cond., \$1,995. John, x36484 or 486-1186.

'78 Honda Moped, 125 mi., \$100. 337-5712.

Audiovisual & Computers

Vic 20 computer, 2 games, B&W TV monitor, joystick. Kevin, x33838 or 471-7889.

Commodore 64 system, CPU, color monitor, disk drive, ex. cond., cables, manuals, software included, \$400; disk drive and printer available. Steve, x35272 or 280-8181.

Portable Radio Shack TRS-80 Model 4P computer, 2 disk, owner manual, ex. cond., was \$1,200, now \$550. 337-2680.

Commodore compatible printer, \$65. Jerry, x31226 or 534-3710.

Amiga 500 Internal RAM expansion (512K), new, \$145; Amiga 1080 monitor, new, \$245. Joe, x31931 or 996-1667.

Photographic

Nikon FM 35mm w/80-200 lens, \$200; METZ 45 CT-1 electronic flash, \$100; Bogen B&W enlarger w/accessories, \$125; Yashica Mat-124 twin-lens reflex, \$115. 334-1126.

Household

Living room suite, contemporary, earth tones, herculon, sofa, \$307; love

seat \$274; chair \$169; oak finish table w/glass inlays, coffee table, \$135; end table, \$112; all ex. cond., all pieces, \$950. Pierre, x32773 or 532-3515.

New rectangular "beveled glass" dining room table, 6 upholstered, padded chairs, \$1,200. 482-2231.

Carpet, 6' x 9', copper, good cond., \$10. Chuck, x31701.

Sofa loveseat, chair, blue, beige, brown floral, good cond., \$150; coffee table, \$40 OBO. Janet, x37355 or 554-4974.

2 brown vinyl bar stools, \$25 ea.; new wooden easel, \$10; 2 large Hibiscus plants, trained in tree form in 5 gal. containers, double orange and pink bloom, \$15 ea. Bob, x32193 or 332-3817.

Baby furniture: changing table, \$20, carseat, \$18, swing, \$20, mattress, \$15, crib, \$50, high chair, \$20, carrier, \$7. Adesua, x39318 or 668-3760.

Queen size mattress and box spring w/frame, good cond., \$150. Carolina, x36229 or 480-1684.

2 twin box springs, ex. cond., \$50 ea.; Kenmore deluxe microwave, 3 stage cooking, 1.4 cu. ft., ex. cond., \$210. 532-1673.

5-drawer chest, 2-drawer night stand, wood, \$98; coffee table, end table, (2) 2-drawer end stands, wood, \$245; sleeper sofa, white and yellow floral velvet, \$128; twin bed, \$35; computer desk, \$65; TV cart, \$25; Sears lawnmower, \$125; exercise bike, \$35. 481-0468.

2 matching early American 3 cushion sofas, oak frame and arms, \$50 ea.; candlestick ceramic lamp, \$10, good cond. Diana, x34371 or 488-5509.

2-yr.-old refrig./icemaker, 20 cu., side-by-side dr., frost free, gold, need dr. repair, \$180. 995-0066.

Antique English china cabinet, \$275. 486-1603.

Contour chair, extra long, vibration, heat, positioning, all functions work, needs upholstery and minor repair, \$100. Ed, x34244 or 471-2542.

Swivel single sofa, \$35 pc., \$50 pr., chest, \$25, small dining table, \$15, single dresser, \$25. 482-6609.

New 23K/24K 70 pc. gold plated flatware, serves 12, chrome nickel steel, padded storage case, list \$1,200, is \$350. Cliff, x38166 or 486-8810.

Antique English FPL mantel w/beveled mirror, \$275; sofa, chair, \$50; bedroom velour arm chair, \$25; Ed, x33824 or 333-3279.

Kenmore W/D, good cond. \$125; walnut Riverside coffee table, end table, \$20 ea.; MW microwave, ex. cond., 1.5 cf, \$150; 25" color Sylvania TV, good cond., \$50. Melody, x33152 or 332-3074.

Sofa custom upholstery earth tones, \$125; Bentwood chair, blue cushion, \$50; color TV 25", \$50; 19", \$75; queen mattress set, \$30; single mattress set, frame, \$50; 7' wood coffee table, \$25; fans, window box, desk top, floor, \$15 ea.; portable stove top, 2 burners, electric, \$10, Gibson guitar, 6 string, blonde wood, ex. cond., hard shell case, \$125. MJ, 480-7226.

Wanted

Want cheap practice piano for children ages 7-10 yrs. old. Greg, x33843.

Want Apple IIE personal computer, printer. Guillery, 480-2367.

Want to buy small tricycle, wagon, for 2 yr. old boy. 482-1505.

Want to buy electric trains. Don, x37832 or 996-1425.

Want 1 large bird cage. Amy, x32696 or 480-8845.

Want roommate(s) to share 3-2 in Friendswood, W/D, cable, microwave, household privileges, non-smokers, \$245/mo., all bills paid. Michael, x38169 or 482-8496.

Want photographic studio equipment, lights, stands, umbrellas, backgrounds, tripods, cameras, props. Michael, x38169 or 482-8496.

Want 1 boys racing bicycle, beginner racer; 1 printer for Commodore 64. 487-1654.

Want male roommate to share 3 BR home in Nassau Bay, 2 blocks from JSC's main gate, \$200/mo., utilities. John, x31929 or 333-5236.

Want to borrow or buy standard 3-foot-wide exterior house door to use while I refinish mine. Chuck, x33295 or 538-3273.

Want experienced guitar and fiddle players for Country Western band being formed with JSC employees. Don, x31439 or 487-1321.

Want roommate to share 3-2-2 in CLC, non-smoker, \$300 plus 1/2 utilities, 4 min. from JSC. 488-8029.

Musical Instruments

Signet oboe, ex. cond. Amy, x32696 or 480-8845.

Piano, Kimball artist console, ex. cond., was \$2,650, now \$2,000, will hold for surprise Christmas present. Marcia, x30195 or 326-4320.

New Casio electronic keyboard, 4 octaves, 8 built-in rhythms, 8 preset instruments, extras, was \$140, now \$75 OBO. 337-5712.

Pets & Livestock

Free male cat, 1 yr. old, gray. 332-1725.

Doberman Puppies, AKC registered, born Oct. 9, black & red, parents on premises, males \$90, females, \$120. John, x33380 or 482-4343.

Personal

Retirement party for Fred Stockum, 36-year veteran, Dec. 17, 1987. Vickie, x31892 or x31894.

Miscellaneous

Sony reel-to-reel stereo tape recorder/player, 3 spd., SOS, microphones, mixer, pillow speaker, tapes, \$250; small Lear-Striedel amplifier, \$25; black 2-pedestal office desk, 4-drawer black file cabinet, \$175; blue IBM Selectric II typewriter w/table, cover, variety of print styles, \$200. Art, 282-4922.

DP Gymnast 2000 Fitness System, wall mount, attachments for bench press, pull ups, leg curls, good cond., \$175. Linda, x33844 or (409) 925-4862.

Martial arts weaponry, variety, ex. cond., will sell by the piece or in sets. Leon, x38514 or 337-5381.

Mint U.S. commemorative stamps, mixed packet, at face value, \$50; 500 different for \$61.52; mixed plate blocks at 10% above face value, \$50. Jeff, 333-7010 or 482-5393.

'75-'76 Ford, auto shop manual, \$40. Fred, x37290.

32 x 11.50R15 LT, wild country radial RVT tire, raised letters, ex. cond., \$45; 455 engine in '74 Pontiac 9 passenger Grand Safari station wagon, PB, PS,

PW, AM/FM, AC, body rust, \$300 OBO. Sanders, x31375 or 534-4839.

Motorcycle helmet, goggles, size 8-9 motocross boots, medium pants, good cond., \$150 OBO. 534-3280.

Crown Ming china, 45 pc. set, serves 8, white w/silver trim, \$50; boy's hiking boots, new, size 7 1/2 D, \$5. Kliesing, x31540 or 482-0833.

Meeks twin-fin surfboard, 5' 9", ex. cond., \$175. David, 488-3966.

Exercise bike, \$25, brass lamp, \$20, easy chair, walnut octagon stand, cherry coffee table. Cindy, x34832 or 538-2417.

Wooden rocking horse from Marshall Field's, was \$350, now, \$100. x30293 or 474-3181.

Colt Car-15, 4x scope, ex. cond., clings, sling, \$500 OBO; Hungarian AK 7.62 x 39mm, accessories, new in box. Ronald, 464-8694.

Small old-fashioned wind up phonograph, old records, \$150. 482-1505.

Suzuki ALT 125, 3 wheel, 5 spd., all-terrain vehicle, new, \$650. Bauch, x31309 or 333-3382.

Camper top for longbed compact pickup, 6', aluminum, bubble side windows, pass thru front window, \$100; Ward's yard tractor, 11 hp, 2 blade 38" cut, needs front steering, linkage work, B & S engine, good cond., \$250; single-sized mattress & box spring, \$75. Stan, x34269 or 471-8956.

Oak console RCA, AM/FM, works, needs repair, cabinet ex. cond., \$75; couch bentwood slat back, cane ends, 93" wide, needs recovering, \$55; Samsonite cosmetic case, aqua, ex. cond., \$25. Suzette, 554-7371.

2 sets of twin 50 Scuba Tanks complete, 72 cu. ft. tank complete. 996-7805.

Early American sofa, quality fabric, earth tones, \$150; 6 new cedar arrows w/screw tips, \$7; '76 & '77 U.S. Proof coin sets, both for \$15. 482-8827.

Cowboy bumper for '86 Chevy pickup, slightly bent, mounting bracket, finish damaged, \$20. Ed, x34244 or 471-2542.

Cookin' in the Cafeteria

Week of November 23 — 27, 1987

Monday — French Onion Soup; BBQ Sliced Beef, Parmesan Steak, Spare Rib w/Kraut, Chili & Macaroni (Special); Ranch Style Beans, English Peas, Mustard Greens. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday — Split Pea Soup; Meatballs & Spaghetti, Liver & Onions, Baked Ham w/Sauce, Corned Beef Hash (Special); Buttered Cabbage, Cream Style Corn, Whipped Potatoes.

Wednesday — Seafood Gumbo; Cheese Enchiladas, Roast Pork w/Dressing, BBQ Link (Special); Pinto Beans, Spanish Rice, Turnip Greens.

Thursday — Holiday - Thanksgiving.

Friday — Seafood Gumbo; Fried Shrimp, Baked Fish, Beef Stroganoff, Fried Chicken (Special); Okra & Tomatoes, Buttered Broccoli, Carrots in Cream Sauce.

Week of November 30 — December 4, 1987

Monday — Cream of Potato Soup; Franks & Sauerkraut, Pork Chop, Potato Baked Chicken, Meat Sauce & Spaghetti (Special); French Beans, Buttered Squash, Buttered Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday — Navy Bean Soup; Beef Stew, Liver & Onions, Shrimp Creole, Smothered Steak w/Dressing (Special); Corn, Rice, Cabbage, Peas.

Wednesday — Seafood Gumbo; Roast Beef, Baked Perch, Chicken Pan Pie, Salmon Croquette (Special); Mustard Greens, Italian Green Beans, Sliced Beets.

Thursday — Beef & Barley Soup; Beef Tacos, Diced Ham w/Lima Beans, Stuffed Cabbage (Special); Ranch Style Beans, Brussels Sprouts, Cream Style Corn.

Friday — Seafood Gumbo; Fried Shrimp, Deviled Crabs, Ham Steak, Salisbury Steak (Special); Buttered Carrots, Green Beans, June Peas.

SANDWICHES

On Wednesday we feature The Reuben: Corned Brisket, Swiss Cheese on a bed of Sauerkraut, Poupon Mustard on Rye